

ANAL CANAL

(1)

* EMBRYOLOGY :-

- The anal canal is derived from two sources :
 1. Proctodeum :- invagination of (ectoderm) that forms the lower $\frac{3}{4}$ of anal canal.
 2. Post-allantoic gut: the lower ^(distal) part of hindgut (endoderm) forming upper $\frac{1}{4}$ of anal canal
- The junction between the two is closed by membrane that ruptures at 10th week and the line of fusion is represented by Dentate (pectinate) line.

* HISTOLOGY :-

- Above dentate line lined by mucous membrane (cubical $\rightarrow$ columnar)
- Below lined by modified skin (sq.) that lacks ^{NO} hair follicles or sweat glands
- Dentate line has nonkeratinized sq. epith, containing minute anal glands open on anal crypts (≈ 15 glands)

* ANATOMY :-

- Anal canal is about 4cm ($1\frac{1}{2}$ inches) Long.
- Begins at ano-rectal ring (inch below & in front of coccyx) and ends at anus, [always closed except at defecation].
- Directed downward & backward.
- Relation:-
 - anterior:- Perineal body & urogenital diaphragm.
 - Posterior:- ano-coccygeal body.
 - Lateral:- ischiorectal fossa.

VISIT...

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- Anal canal contains muscle coat consisting of: (2)

① outer longitudinal layer of smooth ms.

② Inner circular layer of smooth ms.

* Anal sphincter :-

① Internal sphincter :- (involuntary):

- covers upper 2/3 of anal canal, (N/s by autonomic N.)

- It is thickening of circular layer of smooth ms.

② External sphincter : (voluntary):

- covers lower 2/3 of anal canal.

- It is formed of skeletal ms & divided into:

(A) Subcutaneous part: at lower part. (has no bone attachment).

(B) - Superficial part: attached to Perineal body & coccyx.

(C) - deep part: at upper part (has no bone attachment).

- external sphincter supplied by • inf. rectal N. (Pudendal N.)

• Perineal br. of S₄ nerve.

* Anal mucosa :-

- Anal mucosa differs in upper 1/2 from lower 1/2.

	Upper 1/2 of anal canal	Lower 1/2
origin of m.m	mucous membr. derived from endoderm of hindgut	m.m. derived from ectoderm of proctodeum.
Lining of anal canal	Lined by columnar epith. which forms anal columns (vertical folds) which joined by anal valves (semicircular folds joining lower ends of anal columns).	- Lined by stratified sq. epithelium. - No anal columns - No anal valves.
N/s	- supplied by autonomic nerves (hypogastric plexus). - Sensitive only to stretch.	- by somatic nerves (inferior rectal nerve). - Sensitive to Pain, Pressure, Touch, Temperature.
artery supply	- supplied by superior rectal a (from inf. mesenteric a).	- by inferior rectal artery (from internal pudendal a)
vein drain	- drained by superior rectal v (into inf. mesenteric v) → <u>Portal</u>	- into inf. rectal vein (into - int. pudendal v) → into int. iliac v → <u>systemic</u>
lymph drain	- by sup. rectal LN → Para-rectal nodes → inf. mesenteric LN	- superf. ing. LN (medial group)

* Anal muscles :- (ms coat):

(3) *

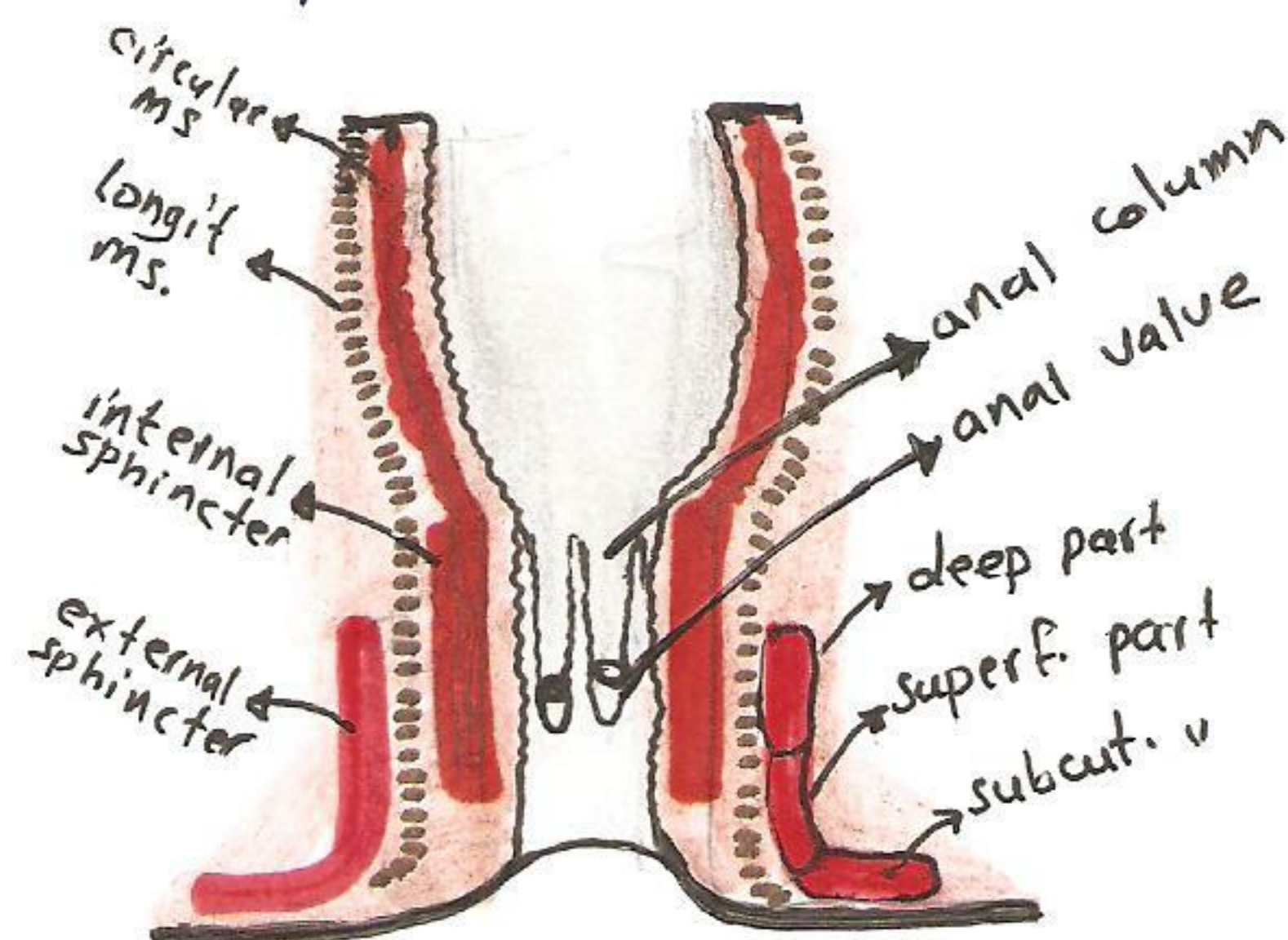
- ① Inner circular layer of smooth ms:- which thickened to form internal sphincter.
- ② Outer longit. layer of smooth ms:- which continuous above with that of rectum & descends in interval between internal & external anal sphincters

• ANORECTAL RING :-

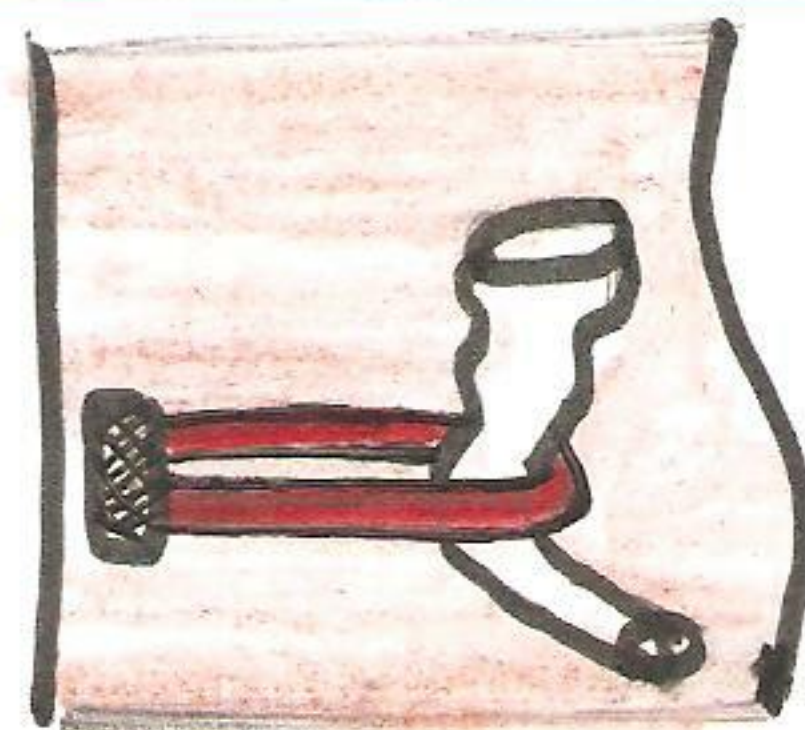
- is formed by union of :-

- ① internal sphincter.
- ② deep part of ext. sphincter.
- ③ Puborectalis muscle

- It can be felt on rectal examination



- **NB**:- Puborectalis fibers of 2 Levator ani blend with deep part of ext. sphincter forming U-shaped sling that attached in front to pubic bones → behind at ano rectal junction → forming acute angle by pulling it forward.



ISCHIO-RECTAL FOSSA

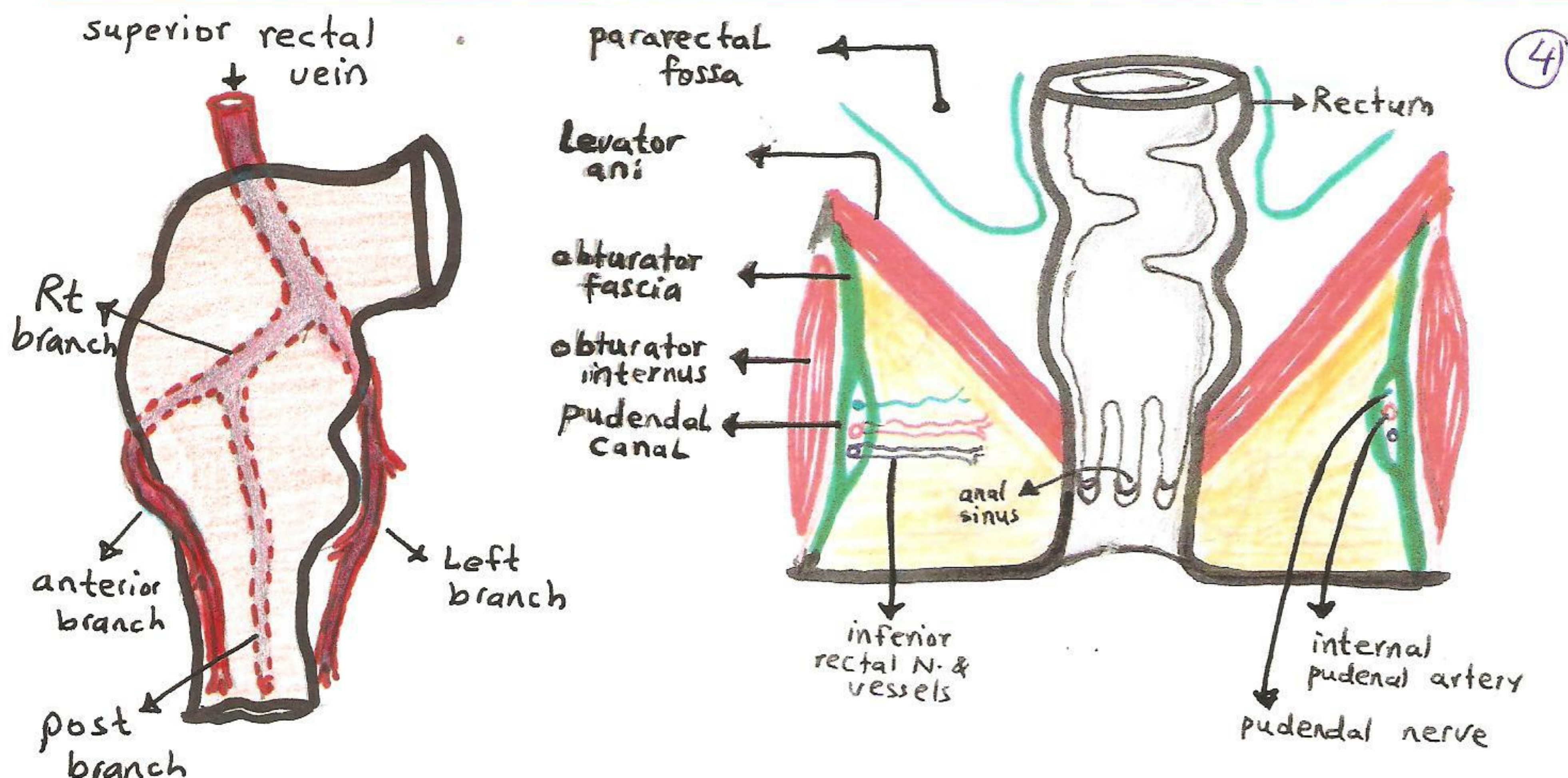
- It is a wedge-shaped space at each side of anal canal.

* Boundaries :-

- Medial wall :- Levator ani & anal canal.
- Lateral wall :- Obturator internus, obturator fascia & Pudendal canal.
- Base (inferior) :- Skin.
- Apex (superior) :- Junction of medial & lat. walls.
- Posterior :- sacrotuberous ligament.
- Anterior :- superficial & deep transv. perineal muscles.

* Contents :-

- ① dense fat.
- ② Inferior rectal nerve & vessels.
- ③ Pudendal nerve & int. pudendal vessels (inside pudendal canal).



DISEASES OF ANAL CANAL

HAEMORRHOIDS "PILES"

*** Definition :-** are dilated veins of anal canal. "Baily & Love"

- enlarged vascular cushions. "churchill"
- Classically occurs at 3, 7, 11 O'clock position
- At least 10% of population have symptomatic piles.



NB :- superior rectal vessels (Portal) forms a vascular plexus with middle & inferior rectal vessels (systemic) under the epithelial lining of anal canal called ~ "Anal Cushions"

* Types :-

maintain flatus.
"mucosa integrity."

- 1- Internal piles :- above dentate line & covered by mucosa
- 2- External piles :- below dentate line & covered by skin

• NB :- External Piles (Perianal hematoma):

- Presented by - Acute Perianal Pain, worse on sitting, walking & defecation
- Tense, tender blue lump at anal verge.
- May subside spontaneous after 2-3 days, give analgenia.
- if presented in acute phase → incision under LA

3- Mixed : interoexternal

*Clinical Picture :- "Baily & Love's"

(5)

- Usually asymptomatic, unless complicated, symptoms are:
- Bleeding per rectum (bright red, painless, usually after defecation), itching, discharge^{mucous}, (Pain if complicated),
- S/S of complications — 1. Prolapse. / incontinence (rare),
2. Strangulation of piles.
3. thrombosis
4. Infection & suppuration. → Portal pyemia
5. gangrene, fibrosis
6. bleeding & anaemia

*Aetiology: Aetiology:

- The cause of haemorrhoids is unknown (Primary piles) but can be secondary piles
- Secondary piles are very rare, may caused by pelvic tumours, pregnancy or Portal hypertension, ca colon, Crohn's
- Primary piles are common usually due to low fiber diet & straining during defecation.

*Pathology: "Principle & Practice of surgery"

- 1st degree :- No prolapse, only bleeding per rectum, (Dx by proctoscopy)
 - 2nd degree :- Prolapse on defecation but return spontaneously.
 - 3rd degree: Prolapse on defecation & has to be reduced manually.
 - 4th degree: Prolapsed all the time (cannot be reduced).
- 2nd degree in Baily
→ 3rd in 5

*Management :-

- = Good history and examination
- = Investigation:- Proctoscopy confirm Piles, sigmoidoscopy to exclude other lesions (as ca colon in old pt).
- = Treatment:-
 - [A] Primary Piles:-
 - 1st, 2nd degree → conservative, inj. sclerotherapy, rubber ligation, cryosurgery, photocoagulation
 - 3rd, 4th → surgery.
 - [B] Secondary Piles:- treat underlying cause.

*Treatment of piles:- "follow"

Current
Churchill & Principle of surgery

• Conservative:-

- avoid constipation & straining, high fiber diet, laxatives
- Demergestant cream & suppositories "e.g. anosol supp."

• Injection sclerotherapy:- (most used)

- inject 2-3 ml of 5% of Phenol in almond oil ^{by Gabriel needle} into submucosa above the pile (not painful above dentate line), one each time at one week interval.
- Complications are: ① Stricture (fibrosis), allergy.
② Pain if deep inj. or below dentate.
③ submucous abscess.

• Rubber band ligation:-

- Using a Barron's bander around pedicle of pile → ischaemia and necrosis → separation later on.

• Cryosurgery:-

- Using liquid nitrogen (-196°C) ^{N_2O or CO_2} → coagulating necrosis → separation.
- Disadvantage → Prolonged mucous ^{sloughs} discharge.

• Photo coagulation:-

- Using infra-red photo coagulation at (100°C) → coagulate necrosis

• Surgery:- indicated in $\begin{cases} 3, 4^{\text{th}} \text{ degree / strang. piles / } \\ \text{pt with Crohn's.} \end{cases}$

- Haemorrhoidectomy: (trans fixation excision operation) ^{complication}
1-bleeding
2-stenosis
3-incontinence
4-fistula

NB:- prolapsed strangulated piles is treated conservatively in the 1st instance (bed rest, analgesia, antibiotic, ice packs...) but interval haemorrhoidectomy is done later to avoid further problems.

- strangulated piles are dangerous, may → portal pyaemia.

- some surgeon do dilatation of anal canal under GA to relieve spasm of internal sphincter, not used nowadays. called Lord's procedure (frequent dilatation → cure 60%). but recurrence high & may → incontinence

ANAL FISSURE

"Fissure in Ano"

* Definition :- "churchill & Baily"

- Longitudinal ^{ischemic} ulcer in midline of anal canal below dentate line
- Occure posterior in $\approx 90\%$ of cases (less blood supply & less supported maximum site of trauma by stool) & 10% anterior.
(multiple fissures may be due to Crohn's disease).

* Aetiology :- "Principle of surgery"

- Constipation with passage of hard stool is the most common aetiology "Primary fissure"
- Secondary anal fissure can be caused by
 - after delivery
 - iatrogenic :- speculum, Post haemorrhoidectomy.
 - Chron's disease, ulcerative colitis.

* Pathology :-

Acute fissure	Chronic fissure
- superficial tear - little inflamm. & oedema - Spastic internal sphincter - Mobile base - No sentinel Pile	- deep ulcer - Marked inflamm. & oedema. - Fibrosed int. sphincter - Fixed base (by fibrosis) - Sentinel pile.

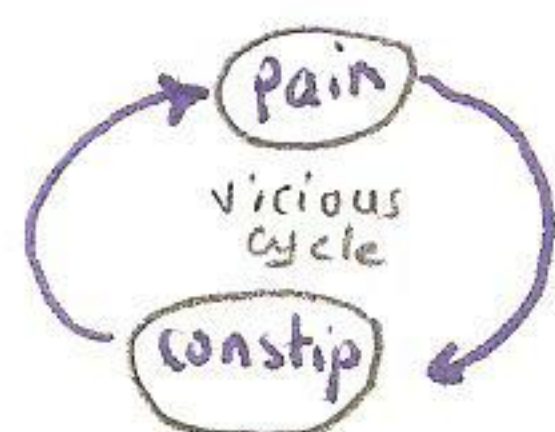
- Sentinel pile :- is an oedematous skin tag at the lower end of fissure

- Complications :- Abscess, fistula, pruritis ani.

D/D :- Crohn's, trauma, Ca., herpes, TB, Φ , Psoriasis
 churchill perianal hematoma, strang. piles.

* Clinical Picture :-

- Symptoms :- Pain (sharp, during defecation, $\uparrow$ with constipation) ^{continue after.}
 - constipation :- pain may compel pt to postpone defecation $\rightarrow$ constipation $\rightarrow$ $\uparrow$ fissure
 - Bleeding :- streak of blood on stool + discharge.
 - reflex symptoms :- burning micturation, dysmenorrhoea
- Signs :- acute stage : fissure may seen, but P/R very painful
 - chronic stage : fissure seen & palpable + sentinel pile



*Treatment :- "Principles of surgery & Bailey"

- The optimal approach is conservative in the 1st instance :-
by ① WASH regimen → Warm bath with dettol (pt sit in it after defec)
→ Anaesthesia :- xylocain gel
→ Stool Softner (Laxative)
→ High Fiber diet
- ② Chemical sphincterotomy :- using GTN cream (trinitrate) ^{MCQ}
(0.2-0.5%) twice daily → relax int. sphincter
this ttt → healing in 50-70% of chronic fissure but side effect is headache. ^{nitrous oxide is neurotransmitter that initial relaxation.}
- other chemicals as nifedipine, injecting botulinus toxin ^{MCQ}

• Acute fissure :- Main ttt is conservative :-

- If failed → digital dilatation under GA.

• Chronic fissure :- Main ttt is surgery :-

① Closed lateral internal sphincterotomy :-

- very successful even in acute fissure (Bailey & Love)
- done by dividing int. sphincter at 3 or 9 o'clock

② Fissurectomy & Post. int. sphincterotomy :-

- excision of fissure & sentinel Pile + dividing int. sphincter posteriorly
- It has become popular recently. → (Bailey).

*NB :- the function of anal canal & pelvic floor musculature can be studied by :-

- 1- pull through manometry.
- 2- electromyography.
- 3- mapping the level & angle of anorectal ring.

ANAL FISTULA

"Fistula in Ano"

(9)

*Definition :-

- Abnormal tract (lined by granulation tissue) extending from skin of perianal region to cavity of anal canal or rectum.

*Aetiology :-

- Most arise from neglected perianal abscess

*Pathology :-

- Lined by granulation tissue, usually persist chronically due to
 - 1- anal canal act as a reservoir for infection.
 - 2- Faecal material may act as a foreign body.
 - 3- Internal opening of tract allows recurrent infection activation.
 - 4- Underlying specific disease (Crohn's, TB, ulcerative, ... etc).

*Classification :-

(A) Standard classification :- (Park class):

- ① low anal fistula ^{common}:- their internal opening below anorectal ring.
- ② High anal fistula:- their internal opening above anorectal ring.

(B) New classification

(Almost all anal fistulas have their int. opening at dentate line).

① Low intersphincteric (70 %):-

- Passes between int. & ext. sphincters

② Low trans-sphincteric (25 %):-

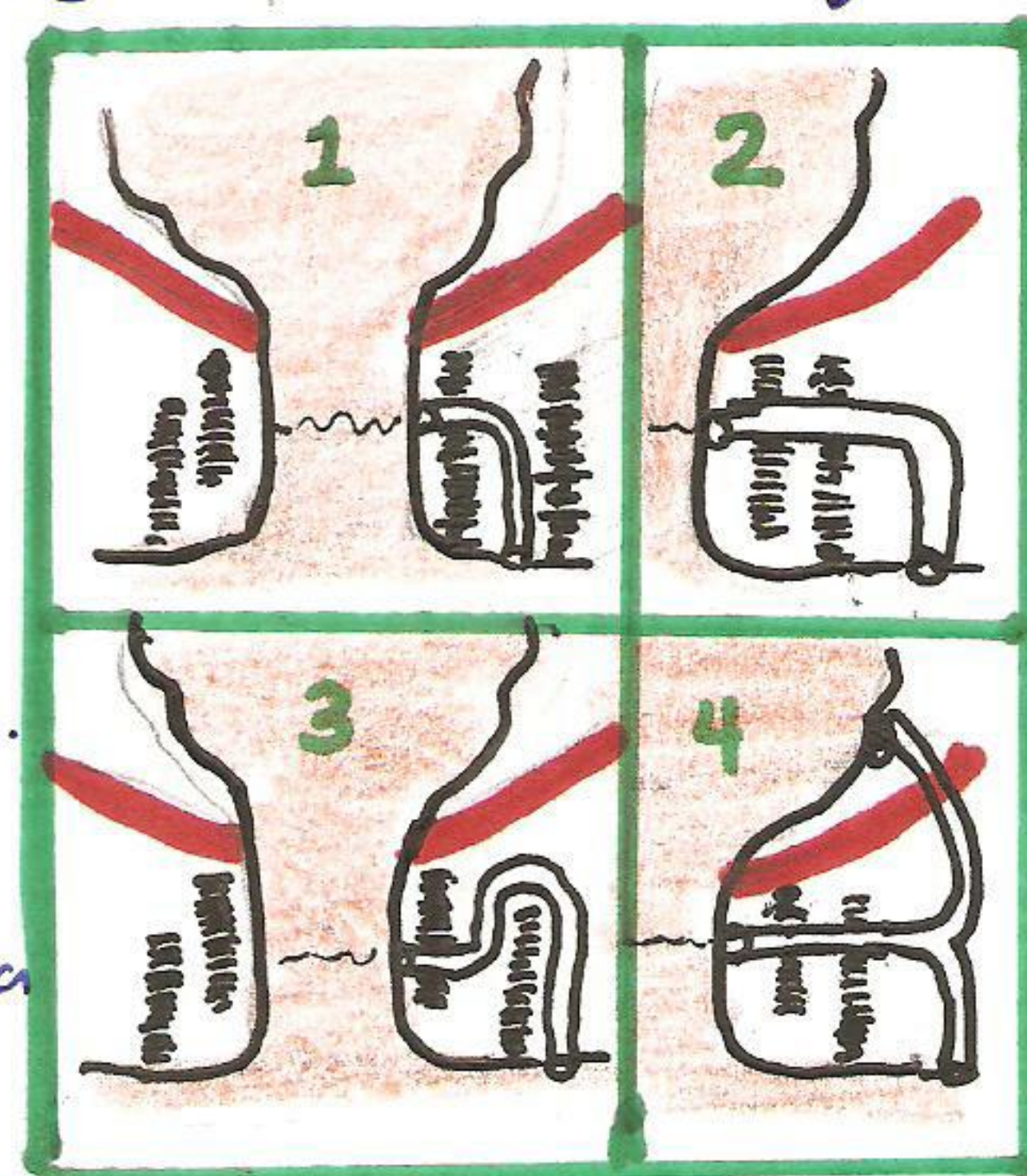
- Passes through int. & ext. sphincters

③ Low supra-sphincteric (4 %):-

- as intersphincteric but enter ischiorectal fossa.

④ High Extra-sphincteric (1 %):-

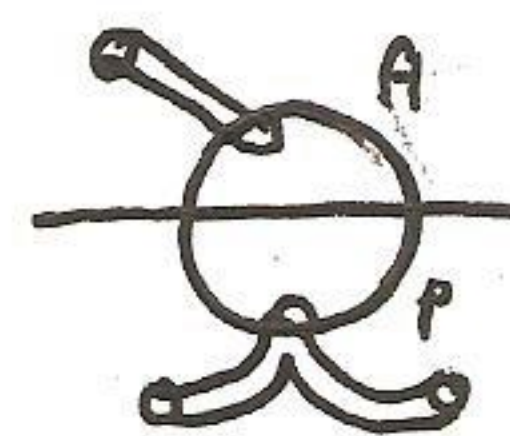
- as trans-sphincteric, enter ischiorectal fossa and levator ani to rectal wall.



Goodall's rule :-

- Posterior fistula (behind line bet. 3, 9 o'clock) open by a common int. opening in midline (6 o'clock) with curved tracks.

- Anterior fistula open has it's own opening & straight track



* Clinical Picture :-

- H/o previous perianal abscess → discharge pus.
- Local soreness & pruritis ani, pain if abscess buildup.
- o/e opening seen, palpable cord (tender indurated track)

* Investigation :-

- Most fistulae require no invest. other than a formal examination under anaesthesia (EUA) "Principle & Practice of surgery"
- Proctoscopy, colonoscopy to ^{see int. opening} exclude other pathology.
- Fistulogram to see the track.

* Treatment :-

- Fistulotomy is done by probing (Probe inserted inside track until bleeds) and laid open (under GA) → heals by granulation tissue from the base.
- High Fistula (Pelvirectal) by two-stage operation, (incontinence may result by damaging puborectalis when opening the track)

NB :- recurrence of anal fistula with the best treatment is 15% as we have ≈ 15 gland in anal canal and fistula occurs in one of them so may affect others.

ANO-RECTAL ABSCESS

* Aetiology & Types :-

① Primary abscess :-

- Infection of glands by G^{-ve} bacilli → intersphincteric abscess that may spread →

- Down → Perianal abscess
- up → Pelvic abscess
- Medial → Submucous "
- Lateral → ischioirectal "



② Secondary abscess :-

- IBD (Crohn's), TB, haematoma, cancer, ... etc

* Classification :-

① Perianal (60%): subcutaneous around anus, Pain & toxic s/s not marked.

② Ischioirectal (30%): in ischioirectal fossa, if bilateral fossae are involved → Horse-shoe abscess, toxic s/s are marked.

③ Submucous (5%): submucosal, above dentate line, Pain, fever severe. and P/R → tender boggy swelling. ↗ ↑ on sitting.

④ Pelvi-rectal (5%): above levator ani, may be secondary to appendicitis, diverticulitis ... etc

* Treatment :-

- Prompt surgical drainage to prevent fistula (occure in $\geq 30\%$ of pt) (no rule for antibiotics except in diabetics & immunocompromised).

PILONIDAL SINUS

• Definition :- chronic infection in skin sinus / caused by penetration of hairs into skin & s/c tissues. commonly in natal cleft, above sacrum.

• Causes :- ① Congenital theory: infected dermoid cyst. ② Acquired theory: (more accepted) → Loose hairs → enters inside skin → Pilonidal abscess. "cut hair inside sinus usually" no hair follicle

may be in hand (interdigital web) (clefts) as in barbers ex MCQ

→ churchill

→ churchill

~ 20%

MCQ

* C/P of Pilonidal sinus :-

- Common in young adult, male, dark & strong hair, black, long sitting (as lorry drivers), bad hygien.

S/S :- may be asymptomatic, usually have discharge or acute abscess (Pain, etc)

D/D :- Perianal fistulae, & abscess

* Treatment :- (Churchill's)

① Pilonidal abscess → incision & drainage of pus.

② Pilonidal sinus :-

- deroofing the track, remove hair & packing

- inject sinus with methylene blue then do wide excision of all tracks (until no dye) and either 1° or ^{delayed 1°} stitching is done (ie left open to heal by granulation).

ANAL CARCINOMA :-

* Pathology :- upper part → adenocarcinoma.

Lower part → sq. cell carcinoma (more common)

* Spread :-

- Direct : eg rectum

- Lymph :- upper part (iliac LN), lower (inguinal LN)

- Blood → mainly liver (in upper part), L, B, B.

* C/P :- bleeding, pruritis, pain, discharge, mass, S/S of secondary (common in homosexual).

* Treatment :- if non-operable → radiotherapy.

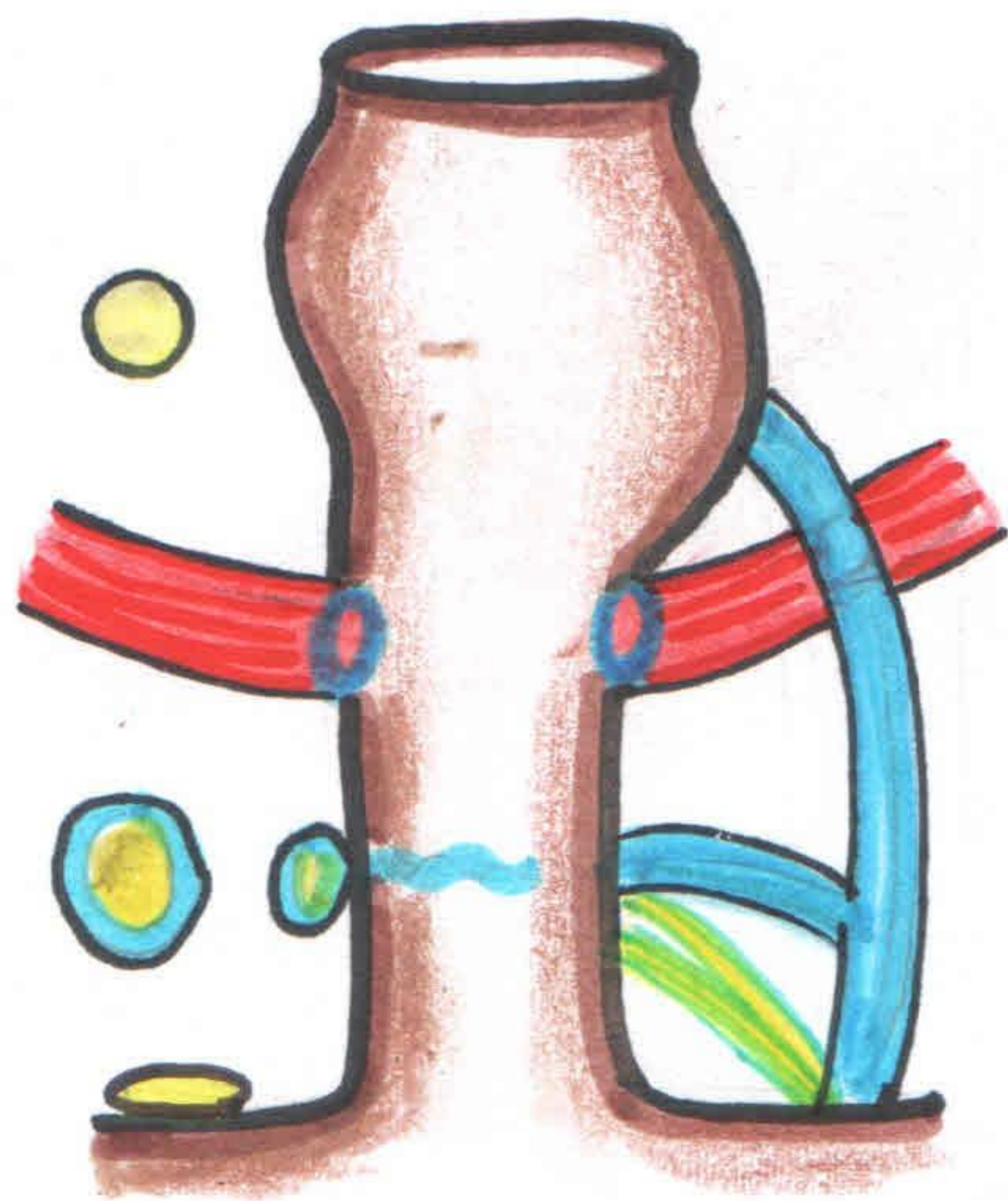
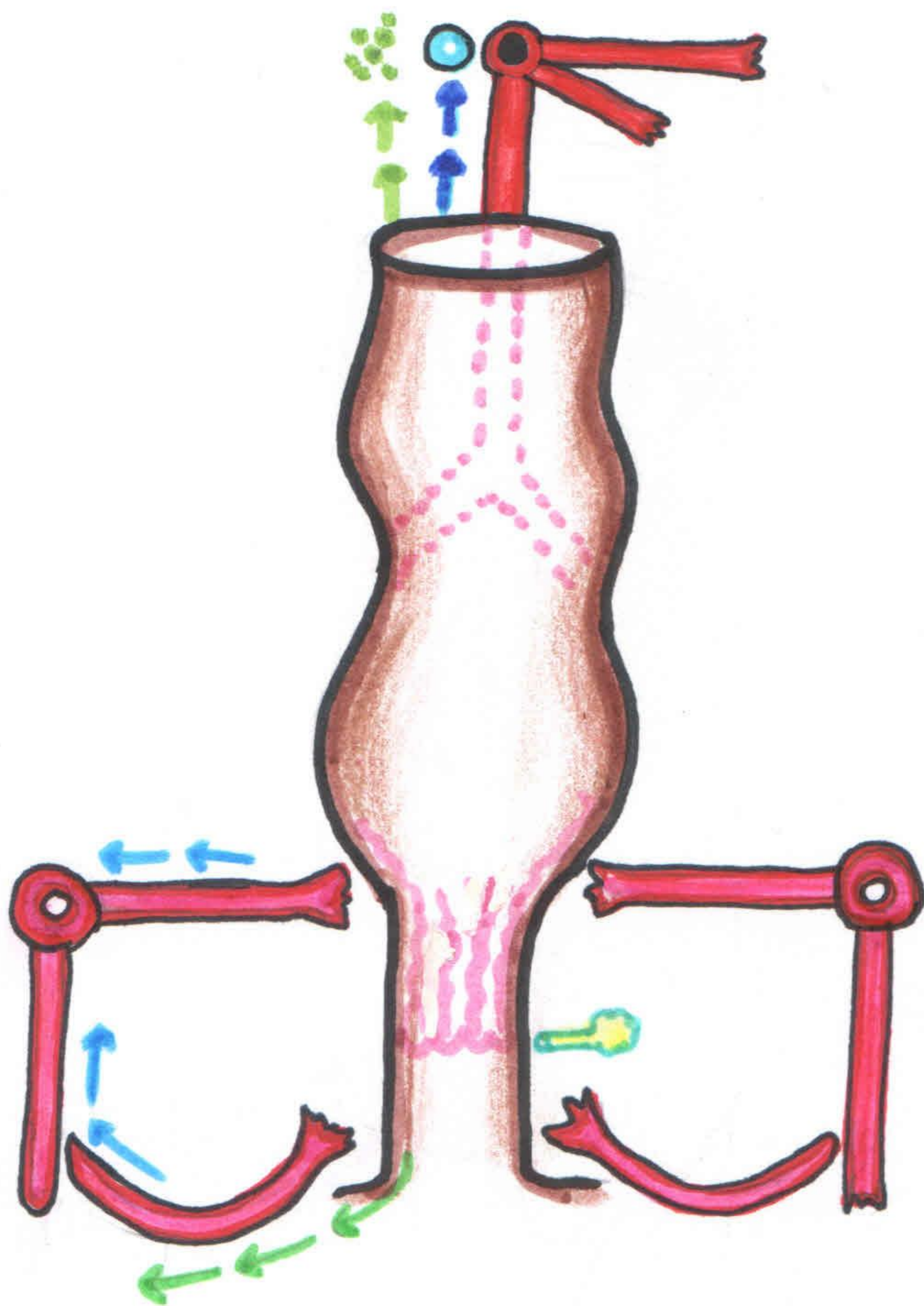
(Churchill)

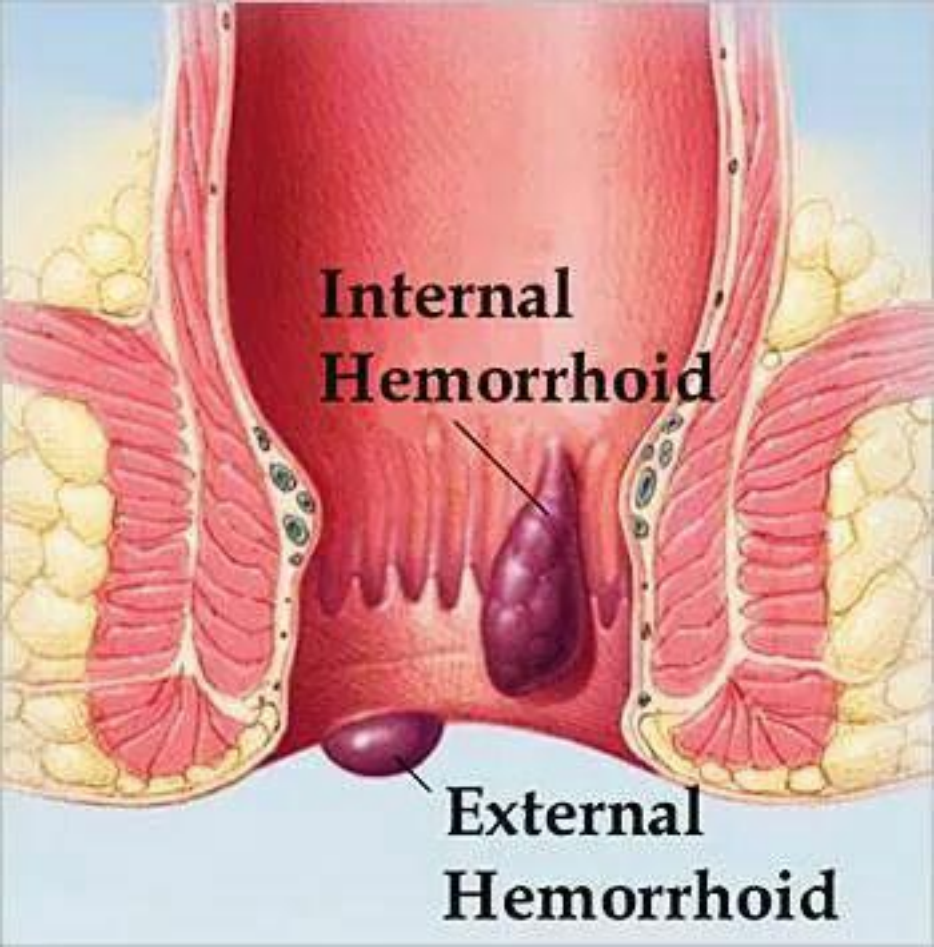
- operable →

- small lesion do wide local excision + radiotherapy

- Large lesion do A-P resection (abdomino-perineal R)

* Prognosis :- 50% of pt survive 5 years.



An anatomical diagram of the human rectum and anal canal in cross-section. The rectum is shown as a large, reddish, muscular tube. The anal canal is at the bottom, surrounded by internal and external sphincter muscles. On the left and right sides, there are layers of yellow adipose tissue and red muscle. Two hemorrhoids are depicted: one is an internal hemorrhoid, which is a dark purple, bulbous mass protruding from the inside of the anal canal; the other is an external hemorrhoid, which is a smaller, dark purple, bulbous mass protruding from the outside of the anal canal. Lines with arrows point from the text labels to the respective hemorrhoids.

**Internal
Hemorrhoid**

**External
Hemorrhoid**